

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): A legged mobile robot ~~made up by~~including a plurality of joint sites ~~and including~~ a plurality of mobile legs, comprising:
a controlling unit configured to control~~means for controlling~~ characteristics of an actuator at one of said plurality of joint sites for ~~controlling~~carrying out, in combination, the ~~control of a~~ gain and ~~a~~ phase compensation of a servo controller belonging to~~of~~ said actuator ~~at each of said joint sites and the control of~~ for controlling a viscous resistance of an actuator motor.

Claim 2 (Currently Amended): The legged mobile robot according to claim 1, wherein said controlling unit~~means for controlling the actuator characteristics sets, for when~~ the actuator ~~of the joint site~~is in need of high precision positioning control and/or orientation stability, ~~the~~a low range gain to a large value, ~~the~~a quantity of phase lead in the high frequency range to a small value, and the viscous resistance of the ~~joint~~actuator motor to a large value, ~~to a small value and to a large value, respectively.~~

Claim 3 (Currently Amended): The legged mobile robot according to claim 1, wherein said ~~means for controlling the actuator characteristics~~controlling unit sets, ~~for when~~ the actuator ~~of the joint site~~is in need of mechanical passiveness and fast response characteristics, ~~the~~a low range gain to a small value, ~~the~~a quantity of phase lead to a large

value, and the viscous resistance of the joint actuator motor to a small value, ~~to a large value~~
and ~~to a small value~~, respectively.

Claim 4 (Currently Amended): The legged mobile robot according to claim 1,
wherein said ~~means for controlling the actuator characteristics~~controlling unit sets, ~~for when~~
the actuator ~~of the joint site~~is in need of buffering ~~the~~a force of impact and performing
followup control of ~~the~~a high frequency range, ~~the~~a low range gain to a small value, ~~the~~a
quantity of phase lead to a large value, and the viscous resistance of the joint actuator motor to
a small value, ~~to a large value~~ and ~~to a small value~~, respectively.

Claim 5 (Currently Amended): The legged mobile robot according to claim 1,
wherein said ~~means for controlling the actuator characteristics~~controlling unit switches
between first actuator characteristics of setting the actuator ~~of each joint site~~ to a large value
of ~~the~~a low range gain, a small quantity of ~~the~~a phase lead, and ~~to a large value~~ of the viscous
resistance of the joint actuator motor and second actuator characteristics of setting the actuator
~~of each joint site~~ to a small value of the low range gain, a large quantity of the phase lead, and
~~to a small value~~ of the viscous resistance of the joint actuator motor, at each step of a shifting
operation on legs.

Claim 6 (Currently Amended): The legged mobile robot according to claim 5,
wherein said ~~means for controlling the actuator characteristics~~controlling unit switches
between first actuator characteristics of setting the actuator ~~of each joint site~~ to a large value
of the low range gain, a small quantity of the phase lead, and ~~to a large value~~ of the viscous

resistance of the ~~joint~~actuator motor and second actuator characteristics of setting the actuator ~~of each joint site~~ to a small value of the low range gain, a large quantity of the phase lead, and ~~to a small value of the viscous resistance of the joint~~actuator motor, at each step of a walking operationmovement on legs.

Claim 7 (Currently Amended): The legged mobile robot according to claim 6,
wherein said ~~means for controlling the actuator characteristics~~controlling unit sets, at a stage of commencing the walking movement, ~~the~~ characteristics of actuators for ~~respective~~ joint sites of a knee joint pitch axis, ankle roll and pitch axes, body trunk roll, pitch, and yaw axes, hip joint roll and pitch axes, and a neck pitch axis to a large value of the low range gain, a small quantity of phase lead in ~~the~~a high frequency range, and ~~to a large value of the viscous resistance of the joint~~actuator motor, and wherein said ~~means for controlling the actuator characteristics~~controlling unit sets the characteristics of actuators for ~~respective~~ joints of a shoulder pitch axis and an elbow pitch axis to a small value of the low range gain, a large quantity of the phase lead, and ~~to a small value of the viscous resistance of the joint~~actuator motor.

Claim 8 (Currently Amended): The legged mobile robot according to claim 6,
wherein said ~~means for controlling the actuator characteristics~~controlling unit sets, at a stage when ~~the~~a leg in a flight state is uplifted and ~~the~~a reactive force from ~~the~~a floor, received by ~~the~~a foot sole ~~thereof~~, is equal to zero, for characteristics of actuators for ~~the~~a knee joint pitch axis, ankle roll axis and ~~the~~an ankle pitch axis of the leg in the flight state, a small value of

the low range gain, a large quantity of the phase lead, and a small value of the viscous resistance of the ~~joint~~actuator motor.

Claim 9 (Currently Amended): The legged mobile robot according to claim 6, wherein said ~~means for controlling the actuator characteristics~~controlling unit sets, at a stage when the walking movement of ~~the~~a leg in a flight state proceeds and the leg touches ~~the~~a floor, with ~~the~~a reactive force from the floor, received by ~~the~~a foot sole thereof, being approximately equal to that ~~during the time~~ when both legs are in ~~the~~a stance position, the characteristics of actuators for ~~the~~a knee joint pitch axis, ankle roll axis, and ~~the~~an ankle pitch axis of the leg previously in the flight state to a large value of the low range gain, a small quantity of the phase lead in ~~the~~a high frequency range, and ~~to~~ a large value of the viscous resistance of the ~~joint~~actuator motor.

Claim 10 (Currently Amended): The legged mobile robot according to claim 6, wherein, in each stage of the walking movement, said ~~means for controlling the actuator characteristics~~controlling unit sets, for characteristics of actuators for driving ~~the respective~~ joints in which emphasis is placed on ~~the~~a positioning accuracy, first characteristics in which the low range gain is of a large value, the quantity of phase lead is of a small value, and the viscous resistance of the actuator motor~~joint~~ is of a large value.

Claim 11 (Currently Amended): The legged mobile robot according to claim 6, wherein, in each stage of the walking movement, said ~~means for controlling the actuator characteristics~~controlling unit sets, for characteristics of actuators for driving ~~the respective~~

joints in which emphasis is placed on ~~the~~a mechanical passiveness or on ~~the~~ fast response characteristics, second actuator characteristics in which the low range gain is of a small value, the quantity of phase lead is of a large value₁ and the viscous resistance of the actuator motor~~joint~~ is of a small value.

Claim 12 (Currently Amended): The legged mobile robot according to claim 6,
wherein, in each stage when ~~the~~a link state formed by ~~the~~a floor touchdown site of the ~~robot~~
body of the legged mobile robot and ~~the~~a floor surface is changed ~~over~~ between ~~the~~a open
link state and ~~the~~a closed link state, said ~~means for controlling the actuator~~
~~characteristics~~controlling unit switches, during the walking movement, the characteristics of
the actuators driving ~~the~~ respective joints between first actuator characteristics and second
actuator characteristics.

Claim 13 (Currently Amended): The legged mobile robot according to claim 5,
wherein, in each stage of the legged mobile robot going up or down ~~the~~ stairs, said ~~means for~~
~~controlling the actuator characteristics~~controlling unit switches characteristics of actuator~~the~~
~~actuator~~ of respective joint sites between first actuator characteristics in which the low range
gain is of a large value, the quantity of the phase lead is of a small value₁ and the viscous
resistance of the actuator motor~~joint~~ is of a large value and second actuator characteristics in
which the low range gain is of a small value, the quantity of the phase lead is of a large value₁
and the viscous resistance of the actuator motor~~joint~~ is of a small value.

Claim 14 (Currently Amended): The legged mobile robot according to claim 13, wherein, in a stage when both legs are in ~~the~~a stance position prior to going up or down the stairs, in ~~the course of the~~an operation of going up or down the stairs, said ~~means for controlling the actuator characteristics~~controlling unit sets ~~the~~ characteristics of the actuators ~~of all of the~~actuator at each joint sites~~ites~~, to the first actuator characteristics in which the low range gain is of a large value, the quantity of the phase lead in ~~a~~the high frequency range is of a small value, and the viscous resistance of the actuator motor~~joint~~ is of a large value.

Claim 15 (Currently Amended): The legged mobile robot according to claim 13, wherein, in a stage when a first step is made for going up or down the stairs, in ~~the course of the~~an operation of going up or down the stairs, said ~~means for controlling the actuator characteristics~~controlling unit sets the characteristics of the actuators of ~~the~~a knee joint pitch axis and ~~the~~an ankle roll and pitch axes of ~~the~~a leg in ~~the~~a flight condition to ~~the~~ second actuator characteristics in which the low range gain is of a small value, the quantity of the phase lead is of a large value, and the viscous resistance of the actuator motor~~joint~~ is of a small value.

Claim 16 (Currently Amended): The legged mobile robot according to claim 13, wherein, in a stage when ~~the~~a leg of ~~a~~the first step has touched ~~the~~a tread face one step higher or lower, in ~~the course of~~ going up or down the stairs, said ~~means for controlling the actuator characteristics~~controlling unit sets the characteristics of the ~~actuators of all of the~~actuator at each joint sites~~ites~~ to ~~the~~ first actuator characteristics in which the low range gain is of a large

value, the quantity of the phase lead in ~~at~~ the high frequency range is of a small value, and the viscous resistance of the actuator motorjoint is of a large value.

Claim 17 (Currently Amended): The legged mobile robot according to claim 13, wherein, in a stage when ~~the~~a leg which touches ~~the~~a tread one step higher or lower ~~becomes a leg in there~~reaches a stance state, and ~~the~~another leg ~~which has so far been the leg in the~~ stance position is uplifted, in ~~the course of going up or down the stairs, said means for controlling the actuator characteristics~~controlling unit sets the characteristics of the actuators of ~~the~~an ankle roll axis and ~~the~~an ankle pitch axis of the uplifted leg ~~in the flight condition to second actuator characteristics in which the low frequency range gain is of a small value, the quantity of the phase lead is of a large value, and the viscous resistance of the actuator motorjoint is of a small value.~~

Claim 18 (Currently Amended): The legged mobile robot according to claim 13, wherein, in a stage when ~~the~~a second step has touched ~~the~~a tread two steps higher in ~~the course of going up or down the stairs, said means for controlling the actuator characteristics~~ controlling unit sets ~~the~~ characteristics of the ~~actuators of all of the~~actuator at each joint sites ~~to the first actuator characteristics in which the low range gain is of a large value, the quantity of the phase lead in the high frequency range is of a small value, and the viscous resistance of the actuator motorjoint is of a large value.~~

Claim 19 (Currently Amended): The legged mobile robot according to claim 13, wherein, in each stage ~~of the movement~~ of going up or down the stairs, ~~said means for~~

~~controlling the actuator characteristics~~controlling unit sets the characteristics of the actuators for driving respective joints~~[[,]]~~ for which emphasis is placed on positioning accuracy, to first actuator characteristics in which the low range gain is of a large value~~[[,]]~~ the quantity of the phase lead is of a small value, and the viscous resistance of the actuator motor~~joint~~ is of a large value.

Claim 20 (Currently Amended): The legged mobile robot according to claim 13, wherein, in each stage of the movement of going up or down the stairs, said ~~means for controlling the actuator characteristics~~controlling unit sets the characteristics of the actuators for driving respective joints~~[[,]]~~ for which emphasis is placed on mechanical passiveness or fast response characteristics~~[[,]]~~ to second actuator characteristics in which the low range gain is of a small value, the quantity of the phase lead is of a large value, and the viscous resistance of the actuator motor~~joint~~ is of a small value.

Claim 21 (Currently Amended): The legged mobile robot according to claim 13, wherein, in each stage of switching of ~~the~~a link state defined by ~~the~~a floor touching site of the ~~robot body of the legged mobile robot~~ and ~~the~~a floor surface, in ~~the course of~~ going up or down the stairs, between ~~the~~an open link state and ~~the~~a closed link state, said ~~means for controlling the actuator characteristics~~controlling unit switches the characteristics of the actuators driving respective joints between the first actuator characteristics and the second actuator characteristics.

Claim 22 (Currently Amended): The legged mobile robot according to claim 5,
wherein, in each stage of ~~the~~a turning movement of the ~~robot~~ body of the legged mobile
robot, said ~~means for controlling the actuator characteristics~~controlling unit switches the
actuators of the respective joint sites between first actuator characteristics in which the low
range gain is of a large value, the quantity of the phase lead is of a small value, and the
viscous resistance of the actuator motor~~joint~~ is of a large value and second actuator
characteristics in which the low range gain is of a small value, the quantity of the phase lead
is of a large value, and the viscous resistance of the actuator motor~~joint~~ is of a small value.

Claim 23 (Currently Amended): The legged mobile robot according to claim 22,
wherein, in a stage of commencing ~~the~~a turning movement of the ~~robot~~ body of the legged
mobile robot, said ~~means for controlling the actuator characteristics~~controlling unit sets the
characteristics of the ~~actuators of all of the~~actuator at each joint sites forming the ~~robot~~
body of the legged mobile robot to a large value of ~~the~~ low range gain, a small quantity of the
phase lead in ~~the~~a high frequency range, and ~~to~~ a large value of ~~the~~ viscous resistance of the
actuator motor~~joint~~.

Claim 24 (Currently Amended): The legged mobile robot according to claim 22,
wherein, in a stage when ~~the~~a leg in ~~the~~a flight state is uplifted and ~~the~~a reactive force from
~~the~~a floor received by ~~the~~a foot sole thereof is zero, said ~~means for controlling the actuator
characteristics~~controlling unit sets the characteristics of the actuators of ~~the~~a knee joint pitch
axis and the ankle roll and pitch axes of the leg in the flight state to a small value of the low

range gain, a large quantity of phase lead, and to a small value of the viscous resistance of the actuator motor joint.

Claim 25 (Currently Amended): The legged mobile robot according to claim 22, wherein, in a stage when the turning movement of the ~~robot body~~ of the legged mobile robot progresses such that ~~the~~a leg in ~~the~~a flight state touches ~~the~~a floor and ~~the~~a reactive force from the floor received by ~~the~~a foot sole ~~thereof~~ is approximately equal to ~~the~~a reactive force during the time when both legs are in the flight state, said ~~means for controlling the actuator characteristics~~ controlling unit sets the characteristics of the actuators of ~~the~~a knee joint pitch axis and ~~the~~ ankle roll and pitch axes of ~~the~~a leg in ~~the~~a stance state to a large low range gain, a small quantity of phase lead in the high frequency range, and to a large viscous resistance of the actuator motor joint.

Claim 26 (Currently Amended): The legged mobile robot according to claim 22, wherein, in each stage of the turning movement, said ~~means for controlling the actuator characteristics~~ controlling unit sets the characteristics of the actuators for driving the ~~respective joints~~ [[,]] for which emphasis is placed on the positioning accuracy [[,]] to first actuator characteristics in which the low range gain is of a large value, the quantity of the phase lead is of a small value, and the viscous resistance of the actuator motor joint is of a large value.

Claim 27 (Currently Amended): The legged mobile robot according to claim 22, wherein, in each stage of the turning movement, said ~~means for controlling the actuator~~

~~characteristics~~controlling unit sets ~~the~~ characteristics of the actuators for driving the respective joints~~[[,]]~~ for which emphasis is placed on ~~the~~ mechanical passiveness or fast response characteristics~~[[,]]~~ to second actuator characteristics in which the low range gain is of a small value, the quantity of the phase lead is of a large value, and the viscous resistance of the actuator motor joint is of a small value.

Claim 28 (Currently Amended): The legged mobile robot according to claim 22, wherein, in each stage in which ~~the~~a link state defined by ~~the~~a floor touch site of the ~~robot~~ body of the legged mobile robot and ~~the~~a floor surface ~~in the course of~~ the turning movement is switched between ~~the~~an open link state and ~~the~~a closed link state, said ~~means for~~ ~~controlling the actuator characteristics~~controlling unit switches ~~the~~ characteristics of the actuators for driving ~~the~~ respective joints between ~~the~~ first actuator characteristics and ~~the~~ second actuator characteristics.